TARDEC

---TECHNICAL REPORT---

THE NATION'S LABORATORY FOR ADVANCED AUTOMOTIVE TECHNOLOGY

WINNER OF THE 1994 FEDERAL QUALITY IMPROVEMENT PROTOTYPE AWARD

No. 13701

TARDEC

MEDIUM GIRDER BRIDGE(MGB)
PALLETIZED LOADING SYSTEM (PLS) M1 FLATRACK
LOAD CONFIGURATION STUDY

March 97

19970317 042

By Dural Horton

APPROVED FOR PUBLIC RELEASE:
DISTRIBUTION IS UNLIMITED

U.S. Army Tank-Automotive Research,
Development, and Engineering Center
Detroit Arsenal
Warren, Michigan 48397-5000

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204 Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (07040188), Washington, DC 20503.

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	5 MAR 97	FINAL

4. TITLE AND SUBTITLE
MEDIUM GIRDER BRIDGE(MGB) PALLETIZED LOADING SYSTEM (PLS) M1 FLATRACK LOAD CONFIGURATION STUDY

5. FUNDING NUMBERS

6. AUTHOR(S)

DURAL HORTON
DSN 786-5955/Comm 810-574-5944
hortondu@cc.tacom.army.mil

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Support Bridge Team
USA TARDEC
AMSTA-TR-R/21
Warren, MI 48397-5000

8. PERFORMING ORGANIZATION REPORT NUMBER
13701

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Weapon Systems Manager - Bridging
USA ATCOM
AMSAT-D-WME
4001 Goodfellow Drive
St. Louis, MO 63120-1798

10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES
This report is not to be construed as an official Department of the Army position. Destroy this report when no longer needed. Do not return to the originator.

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Distribution A.
Approved for public release; distribution is unlimited.

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

This report addresses the Palletized Loading System (PLS) M1 flatrack loading configurations for the Medium Girder Bridge (MGB) Bridge Set, Erection Set and Link Reinforcing Set (LRS). The optimum arrangement of MGB components on PLS M1 flatracks was determined through the use Computer Aided Modeling (CAM) of both MGB components and the PLS M1 flatrack. The results of the study are that the MGB Bridge Set can be loaded onto a minimum of six M1 flatracks, the Erection Set can be loaded onto two M1 flatracks and the LRS can be loaded onto one M1 flatrack. Modified Bridge and Erection sets were also modeled. The modified Bridge Set eliminates multiple shorter bridging capabilities through the removal of duplicate end-of-bridge components. The modified Erection set eliminates simultaneous erection capabilities through the removal of duplicate erection components. The modified Bridge Set can be loaded, with less than full height loads, onto seven M1 flatracks, the modified Erection Set can be loaded onto one M1 flatrack. Modified LRS configurations were not examined. An MGB set contains two Bridge and two Erection Sets and one LRS, an MGB set composed of modified Bridge and Erection Sets still retains multiple bridging and simultaneous launching capabilities.

14. SUBJECT TERMS
Military Bridging, Medium Girder Bridge (MGB), Multi-Role Bridge Company (MRBC), Palletized Loading System (PLS), M1 Flatrack.

15. NUMBER OF PAGES
22

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UL

TABLE OF CONTENTS

1. INTRODUCTION

Total Army Analysis 2001 (TAA01) authorizes a total of 21 bridge companies. The US Army Engineering School (USAES) proposes that these remaining companies be configured into Multi-Role Bridge Companies (MRBCs) which would be capable of spanning both wet- and dry-gaps. To facility the move to the MRBC a common transporter for both the Ribbon Bridge (RB) and the Heavy Dry Support Bridge (HDSB) is required. This transporter, the Common Bridge Transporter (CBT), is based on the Heavy Expanded Mobility Tactical Truck (HEMTT) chassis with Palletized Loading System (PLS) hardware attached.

Before the HDSB is fielded, MRBCs will be configured with the existing Medium Girder Bridge (MGB). During this interim phase, MGB components will be transported by the CBT. This will reduce the need for maintaining separate wet- and dry-gap bridge transporters in the inventory. For this interim configuration the MGB will be configured onto PLS M1 flatracks. The payload of a CBT with an M1 flatrack is approximately 7,120 kg (15,700 lb.)[1]. Currently the MGB is configured on MGB unique pallets which are loaded on 5-Ton dump trucks and 4-Ton bolster trailers.

With the above in mind, the USAES requested that the Tank-Automotive Research Development and Engineering Center (TARDEC) Support Bridge Team examine the feasibility of placing MGB components onto M1 flatracks. Specific areas of interest were how many M1 flatracks are needed to transport an existing MGB Company, with a break-out by MGB Bridge Set, MGB Erection Set, and MGB Link Reinforcing Set (LRS). Additional information desired was the specific component load configurations for each flatrack. Current MGB companies have two MGB sets with each MGB set containing two Bridge Sets, two Erection Sets, and one LRS. This report addresses this concept, placing MGB onto M1 flatracks without modifying the specific sets, as Scenario A.

Another area of interest which USAES wanted examined were what would the load configurations be for a modified MGB Set. A modified MGB set would be comprised of two modified Bridge Sets and two modified Erection Sets and one LRS. The LRS would remain unchanged. A modified Bridge Set would reduce component count by eliminating duplicate end-of-bridge components and hence eliminating multiple bridging capability within a Bridge Set. A

[1]This value assumes the payload affects only the rear tandem axles. Higher payloads are possible if the CG of the loaded flatrack is towards the front of the vehicle and the front tandem axles carry a portion of the load.

modified Erection Set would reduce component count by eliminating those components required for simultaneous launching within a single Erection Set. This report addresses this concept, placing modified MGB sets onto M1 flatracks, as Scenario B. It should be noted that an MGB Set modified in this manner still retains the capability of making multiple shorter bridges and simultaneously launching two bridges at a time as there is more than one Bridge Set and more than one Erection Set per MGB Set.

The rational for the modified MGB Set is that it will reduce the training, manpower, transport, and storage requirements of the MGB. By consolidating MGB components into sets which are only capable of making one bridge per Bridge Set, or launching no more than one bridge at a time per Erection Set, additional unused components are not hauled from site to site, required to be inventoried, or required to be trained with. With four modified Bridge Sets and four modified Erection Sets, the Multi-Role Bridge Company (MRBC) will still have the capability of simultaneously making and launching multiple shorter bridges. This reduction of components per MGB set also allows for a redistribution of existing, limited assets. It should be noted that the lost capabilities represent diminishing returns in the current environment of downsizing and emphasis on efficient utilization of all resources.

2. PROCEDURE

The first scenario modeled, Scenario A, assumed that the MGB set would be transferred from the existing MGB pallets onto the M1 flatracks as is, i.e. no additions, reductions, or deletions of any components. The second scenario modeled, Scenario B, modifies the MGB set by modifying the Bridge Set and Erection Set. While the component count is reduced for these modified sets, the load heights have also been reduced to represent a more realistic soldier loading/unloading height as well. Thus the flatrack count for Scenario B remains unchanged from that of Scenario A.

Computer Aided Modeling (CAM) was used to assist in the analysis. Pertinent components were graphically modeled on a computer. Miscellaneous components, i.e. smaller components not normally packed into equipment baskets, tiedown equipment, and cribbing were not modeled. Components which were modeled were then configured onto flatracks until the optimal solution was found.

The following criteria were considered in determining the load configurations for each flatrack in each scenario:

- Order in which components are required.
- Logical groupings of components needed to reduce number of unique flatrack loads.
- Weights of components and heights of specific loads for soldier only loading/unloading missions.
- Overall dimensions of components and 'nestability.'
- Stability of flatrack loads for general transport operations.
- Stability of loads for PLS transloading operations.
- Payload Cube & Weight of CBT with M1 flatrack.
- Mobility of CBT with loaded M1 flatrack.

3. RESULTS: SCENARIO A

For Scenario A, it was determined that six (6) flatracks are required for the Bridge Set, two (2) flatracks are required for the Erection Set and one (1) flatrack is required for the LRS. Table 1 shows the total number of flatracks required for the MRBC for Scenario A with a breakout by set. This configuration optimizes the components into a 6-Bay Double Story (DS) bridge and a 6-Bay Single Story (SS) bridge. This configuration also allows for one flatrack to erect either SS or DS bridges. Minimal rearrangement of components is required if a longer DS bridge, up to 12 Bays, is desired. A longer DS bridge will result in a correspondingly shorter SS bridge. Table A-1 breaks out the flatrack requirements for each set and gives a description of the components on each flatrack. Appendix C shows the flatrack load configurations for Scenario A.

TABLE 1. Existing Sets, Flatracks Required per MRBC.

Set	Flatracks per Set	Number of Sets	Total
Bridge Set	6	4	24
Erection Set	2	4	8
LRS	1	2	2
Spares/Additional Growth[a]	-	-	2
Total			36

[a]The total number of M1 flatracks which have been allocated to the MRBC for the MGB is 36. The Spares/Additional Growth number reflects the difference between the number of flatracks determined as necessary for this scenario and the total number allocated.

The intent of Scenario A was to determine the minimum number of flatracks necessary. Several of the load heights are at or slightly exceed the 2.44 m (8 ft) height limit. It is believed that this will not be a significant issue because the modeling slightly exaggerates overall load dimensions. This is because the modeling of specific components does not capture finer details which would contribute to 'nesting'. The highest load of Scenario A is 2.49 meters (98.0 in) from the base of the flatrack and the highest a component must be lifted is 2.27 meters (89.4 in) from the ground. The vertical Center of Gravity (CG_z) of these loads is roughly half that of the payload height (height from ground minus flatrack depth). The CGs are roughly centered latitudinal and longitudinally on the flatrack plus or minus a few centimeters. These CG estimates are only approximations as this study did not specifically address this issue. Mobility of the CBT is not degraded as the weights of the loaded flatracks are below the payload weight limit of 7,120 kg (15,700 lb). Flatrack weights and estimated vertical CG heights (CG_z) are listed in Table A-2. Components and their quantities for each flatrack are listed in Table A-3.

Two problems which arise from high flatrack loads are that hand loading and unloading operations are difficult and the 4.0 m mobility height limit requirement may be exceeded. A Common Bridge Transporter (CBT), with a 2.44 m (8.0 ft) high loaded flatrack, is 4.0 m (13.1 ft) high. Components which exceed the height of the flatrack may exceed the 4.0 m height limit when the flatrack is loaded on the CBT. More flatracks would be required if components were to be redistributed into shorter loads.

4. RESULTS: SCENARIO B

For Scenario B, it was determined that the best solution for configuring the components of the alternate Bridge Set was to distribute them into seven (7) loads. Table 2 shows the total number of flatracks required for the MRBC with a breakout by set. This configuration optimizes the components into a 12-Bay Double Story (DS) bridge. The Spares flatrack contains the necessary components, when combined with the other flatracks in the alternate Bridge Set, necessary to make a SS bridge if a DS bridge is not desired. Again, only one flatrack is required to erect either SS or DS bridges. The second Erection Set flatrack from Scenario A is eliminated from this scenario. Table B-1 breaks out the flatrack requirements for each set and gives a description of the components on each flatrack. Appendix D shows the flatrack load configurations for Scenario B.

TABLE 2. Modified Sets, Flatracks Required per MRBC.

Set	Flatracks per Set	Number of Sets	Total
Modified Bridge Set	7	4	28
Modified Erection Set	1	4	4
Link Reinforcing Set	1	2	2
Spares/Additional Growth[a]	-	-	2
Total			36

[a]The total number of M1 flatracks which have been allocated to the MRBC for the MGB is 36. The Spares/Additional Growth number reflects the difference between the number of flatracks determined as necessary for this scenario and the total number allocated.

Load heights are kept well below the 2.44 m (8 ft) height limit. The highest load of the Scenario B sets is 2.12 meters (83.5 in) from the base of the flatrack and the highest a component must be lifted is 1.94 meters (76.4 in) from the ground. The vertical Center of Gravity (CG_z) of these loads is roughly half that of the payload height (height from ground minus flatrack depth). The CGs are roughly centered latitudinal and longitudinally on the flatrack plus or minus a few centimeters. These CG estimates are only approximations as this study did not specifically address this issue. Mobility of the CBT is not degraded as the weights of the loaded flatracks are well below the payload weight limit of 7,120 kg (15,700 lb). Flatrack weights and estimated vertical CG heights (CG_z) are listed in Table B-2. Bridge and Erection/Launch components and their quantities for each flatrack are listed in Table B-3. For completeness, those components which are eliminated from Scenario A are listed in Table B-4.

By combining two alternate Bridge Sets and one Link Set it is possible to make one 49.4 m (162 ft) 22 Bay DS bridge which can span a gap of 46.2 m (151.5 ft). Also, two bridges whose total number of bays do not exceed 24 bays can also be built, the longer bridge, if over 12 bays, would use the Link Reinforcing Set.

5. CONCLUSION

Tie-Down procedures for standard transport operations will use the 20 nylon straps that come with each flatrack. Tie-Down procedures must ensure that each load is secure from side-to-side movement as well as end-to-end movement during both transport and transloading operations. For transport operations other than on the CBT (overseas shipment, etc.) steel strapping should be used.

This analysis did not specifically consider the packaging of MGB components onto the Container Roll-In\Out Platform System (CROPS). However, cursory examination of the flatrack components and payload dimensions shows that for Scenario B the End+2Bays, 4Bays, and Deck&Ramp flatracks should be acceptable with minor shifting of components. The Spares and Erection flatracks may be acceptable with major rearrangement of components and the Link Reinforcement flatrack is unlikely to be able to fit onto a CROP even with major rearranging of components.

6. RECOMMENDATIONS

This study is only a first step in placing MGB components on PLS M1 flatracks. The results of this study must be verified by tests. However, much of the initial ground work was done using CAD which should reduce the amount of actual testing required. The configurations suggested by the modeling should be used as a starting point with only minor modifications in actual component configurations being required. The appendices show a graphical representation of each of the flatrack loads necessary per respective scenario.

Once the MRBC is issued the HDSB, the MGB will be removed from the MRBC. Packaging MGB components onto M1 flatracks will facilitate this process. No additional reconfiguration, repalletizing, or repackaging is required. The M1 flatracks can be downloaded at storage sites with minimal additional preparation being required. The elements, pilferage, and other like issues must be considered.

APPENDIX A
SCENARIO A TABLES

TABLE A-1. Existing Sets, Flatrack Loads Nomenclatures, Quantities per Set, and Descriptions.

Nomenclature	Quantity Bridge Set	Description
End + 3 Bays	2	-All structural components necessary to form 1 end and 3 interior bays of a 6-Bay DS bridge.
6 Interior Bays	1	-All structural components necessary to form lower story interior bays of a DS bridge.
Deck & Ramp	1	-All deck, ramp, and curb components necessary to form a 6-Bay DS bridge.
6-Bay SS Bridge	1	-All components necessary to form a 6-Bay SS bridge.
Spares	1	-Spares and remaining components of the Bridge Set.
Nomenclature	**Quantity Erect. Set**	**Description**
DS/SS Erection	1	-All components necessary to erect a DS or a SS bridge.
SS Erection	1	-All components necessary to erect a SS bridge plus remaining components in the existing set.
Nomenclature	**Quantity LRS**	**Description**
LRS	1	-All components of the existing LRS.

[a]To form a 7-*12* Bay DS Bridge, the appropriate number of Top Panels, Decks, and Curbs must be moved from the 6-Bay SS Flatrack to the 7-*12* Bay DS Flatrack.

TABLE A-2. Existing Sets, Flatrack Load Weights and Heights.

Flatrack Load	Payload Weight[a] kg	(lb)	Payload Height from ground m	(in)	Highest Lift from ground m	(in)	CG_z (Est.) from deck m	(in)
End + 3 Bays	5,136	(11,325)	2.38	(93.7)	2.08	(81.9)	1.04	(40.9)
6 Interior Bays	3,594	(7,925)	2.14	(84.3)	1.84	(72.4)	0.92	(36.2)
Deck & Ramp	6,378	(14,063)	2.40	(94.5)	2.10	(82.7)	1.05	(41.3)
6-Bay SS Bridge	6,964	(15,356)	2.49	(98.0)	2.27	(89.4)	1.09	(42.9)
Spares	6,607	(14,568)	2.47	(97.2)	1.99	(78.3)	1.08	(42.5)
DS/SS Erection	3,672	(8,097)	1.99	(78.3)	1.53	(60.2)	0.84	(33.1)
SS Erection	1,721	(3,795)	1.57	(61.8)	1.57	(61.8)	0.63	(24.8)
LRS	4,769	(10,516)	2.12	(83.5)	1.75	(68.9)	0.73	(28.7)

[a]Payload weight equals the combined weight of individual components listed in Table A-3 plus 5% for miscellaneous components, tiedown equipment, and cribbing.

APPENDIX A (continued)
SCENARIO A TABLES

TABLE A-3. Existing Sets, Components by Flatrack.

Flatrack Load	Components[a]	
End + 3 Bays	1 Bankseat Beam	4 Equipment Baskets-A
	6 Bottom Panels	2 Junction Panels
	5 Decks	10 Top Panels
	2 End Taper Panels	Miscellaneous
6 Interior Bays	12 Bottom Panels	2 Top Panels
	6 Deck	Miscellaneous
	3 Equipment Baskets-A	
Deck & Ramp	32 Curbs	14 Long Ramps
	34 Decks	Miscellaneous
6-Bay SS Bridge	2 Bankseat Beam	14 Short Ramp
	12 Curb	12 Top Panel
	24 Deck	Miscellaneous
	2 Equipment Baskets-A	
Spares	3 Bankseat Beam	16 Short Ramps
	2 Bottom Panels	15 Long Ramps
	1 End Taper Panel	Miscellaneous
	1 Junction Panel	
DS/SS Erection	6 Adjustable Support	6 Launching Noses, Heavy
	6 Baseplates (DS)	2 Launching Nose Rollers
	3 Bldg. Frame Cross Girders	2 Light Launching Noses, Frnt
	2 Building Pedestals	2 Light Launching Noses, Rear
	5 Equip. Baskets-2B, 2C, &1D	2 Longitudinal Girders
	2 Fixed Supports	2 Push Bar Cross Girders
	2 Jack Supports & 2 Posts	2 Roller Beams
	3 Landing Rlrs & 2 Pedestals	Miscellaneous
	1 Launching Nose Cross Girder	
SS Erection	2 Adjustable Supports	2 Landing Pedestals
	5 Building Pedestals	1 Launching Nose Cross Girder
	1 Equip. Basket-B	2 Launching Noses, Heavy
	5 Fixed Supports	3 Light Launching Noses, Frnt
	3 Jack Supports	3 Light Launching Noses, Rear
	2 Jack Posts	2 Roller Beams
	2 Landing Rollers	Miscellaneous
LRS	4 Anchor Assemblies	2 Jacking Brackets
	1 Capsill	20 Long Reinforcing Links
	2 Davit Post Assemblies	4 Post Tensioning Assemblies
	4 Equipment Baskets E-H	2 Rocking Rollers
	4 Footwalk	4 Short Reinforcing Links
	10 Footwalk Bearers	Miscellaneous

[a]Only CAD modeled components are shown, it is assumed that miscellaneous components will be able to fit where space is available.

APPENDIX B
SCENARIO B TABLES

TABLE B-1. Modified Sets, Flatrack Load Nomenclatures, Quantities per Set, and Descriptions.

Nomenclature	Quantity Bridge Set	Description
End + 2 Bays	2	-All structural components necessary to form 1 end and 2 interior bays of a 12-Bay DS bridge
4 Bays	2	-All structural components necessary to form 4 interior bays of a DS bridge.
Deck & Ramp	2	-All deck, ramp, and curb components necessary to form a 12-Bay DS bridge.
Spares	1	-Spares necessary for 12-Bay DS bridge. Allows above components to construct SS bridge also.
Nomenclature	**Quantity Erect. Set**	**Description**
DS/SS Erection	1	-All components necessary to erect a DS or a SS bridge.
SS Erection	1	-All components necessary to erect a SS bridge.
Nomenclature	**Quantity LRS**	**Description**
LRS	1	-All components of the existing LRS.

TABLE B-2. Modified Sets, Flatrack Load Weights and Heights.

Flatrack Load	Payload Weight[a] kg	(lb)	Payload Height from ground m	(in)	Highest Lift from ground m	(in)	CG_z (Est.) from deck m	(in)
End + 2 Bays	3,966	(8,745)	2.08	(81.9)	1.54	(60.6)	0.89	(35.0)
4 Bays	3,310	(7,299)	1.71	(67.3)	1.41	(55.5)	0.70	(27.6)
Deck & Ramp	5,047	(11,129)	2.08	(81.9)	1.94	(76.4)	0.90	(35.4)
Spares	3,708	(8,176)	2.05	(80.7)	1.50	(59.1)	0.75	(29.5)
DS/SS Erection	3,672	(8,097)	1.99	(78.3)	1.53	(60.2)	0.84	(33.1)
LRS	4,769	(10,516)	2.12	(83.5)	1.75	(68.9)	0.73	(28.7)

[a] Payload weight equals the combined weight of individual components listed in Table B-3 plus 5% for miscellaneous components, tiedown equipment, and cribbing.

APPENDIX B (continued)
SCENARIO B TABLES

TABLE B-3. Modified Sets, Components by Flatrack.

Flatrack Load	Components[a]	
End + 2 Bays	1 Bankseat Beam	2 Junction Panels
	4 Bottom Panels	8 Top Panels
	2 End Taper Panels	Miscellaneous
	4 Equipment Baskets-A	
4 Bays	8 Bottom Panels	8 Top Panels
	2 Equipment Baskets-A	Miscellaneous
Deck & Ramp	32 Curbs	7 Long Ramps
	34 Decks	Miscellaneous
Spares	1 Bankseat Beam	1 Junction Panel
	2 Bottom Panels	2 Top Panels
	2 Curbs	14 Short Ramps
	4 Decks	Miscellaneous
	1 End Taper Panel	
DS/SS Erection	6 Adjustable Support	6 Launching Noses, Heavy
	6 Baseplates (DS)	2 Launching Nose Rollers
	3 Bldg. Frame Cross Girders	2 Light Launching Noses, Frnt
	2 Building Pedestals	2 Light Launching Noses, Rear
	5 Equip. Baskets-2B, 2C, &1D	2 Longitudinal Girders
	2 Fixed Support	2 Push Bar Cross Girders
	2 Jack Supports & 2 Posts	2 Roller Beams
	3 Landing Rlrs & 2 Pedestals	Miscellaneous
	1 Launching Nose Cross Girder	
LRS	4 Anchor Assemblies	2 Jacking Brackets
	1 Capsill	20 Long Reinforcing Links
	2 Davit Post Assemblies	4 Post Tensioning Assemblies
	4 Equipment Baskets E-H	2 Rocking Rollers
	4 Footwalk	4 Short Reinforcing Links
	10 Footwalk Bearers	Miscellaneous

[a]Only CAD modeled components are shown, it is assumed that miscellaneous components will be able to fit where space is available.

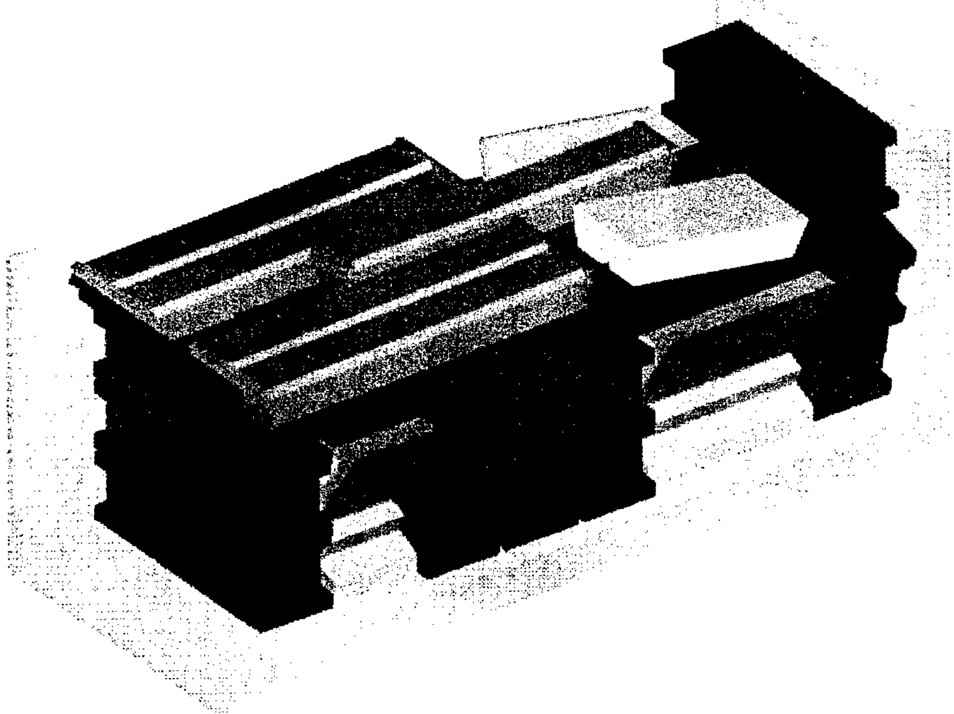
TABLE B-4. Modified Sets, Eliminated Components.

Set	Components[a]	
Bridge Set	4 Bankseat Beams	2 Equipment Baskets-A
	8 Curbs	15 Long Ramps
	2 Decks	16 Short Ramps
Erection Set	2 Adjustable Supports	2 Landing Pedestals
	5 Building Pedestals	1 Launching Nose Cross Girder
	1 Equip. Basket-B	2 Launching Noses, Heavy
	5 Fixed Supports	3 Light Launching Noses, Frnt
	3 Jack Supports	3 Light Launching Noses, Rear
	2 Jack Posts	2 Roller Beams
	2 Landing Rollers	
LRS	None	

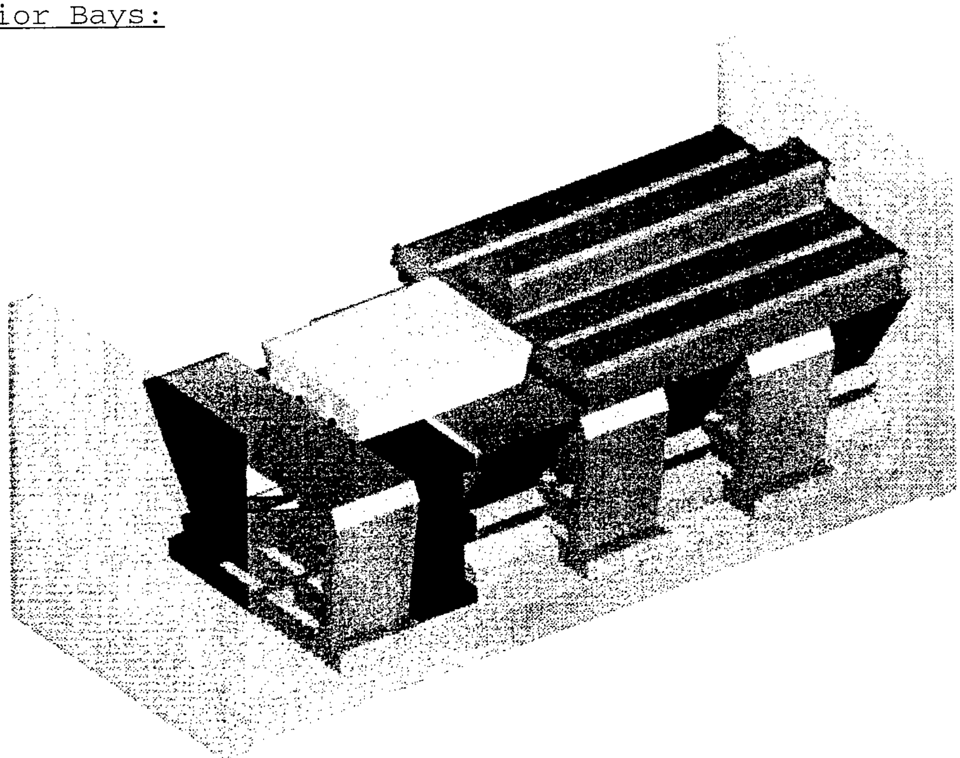
[a]Only CAD modeled components are shown for consistency.

APPENDIX C
SCENARIO A FLATRACK LOADS

End + 3 Bays:

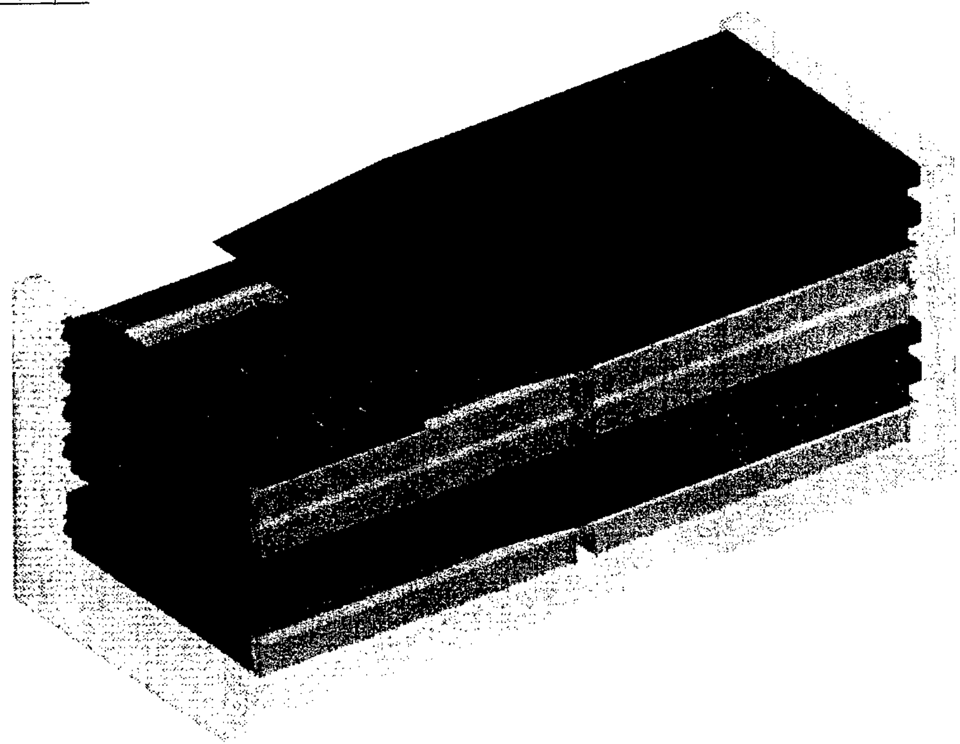


6 Interior Bays:

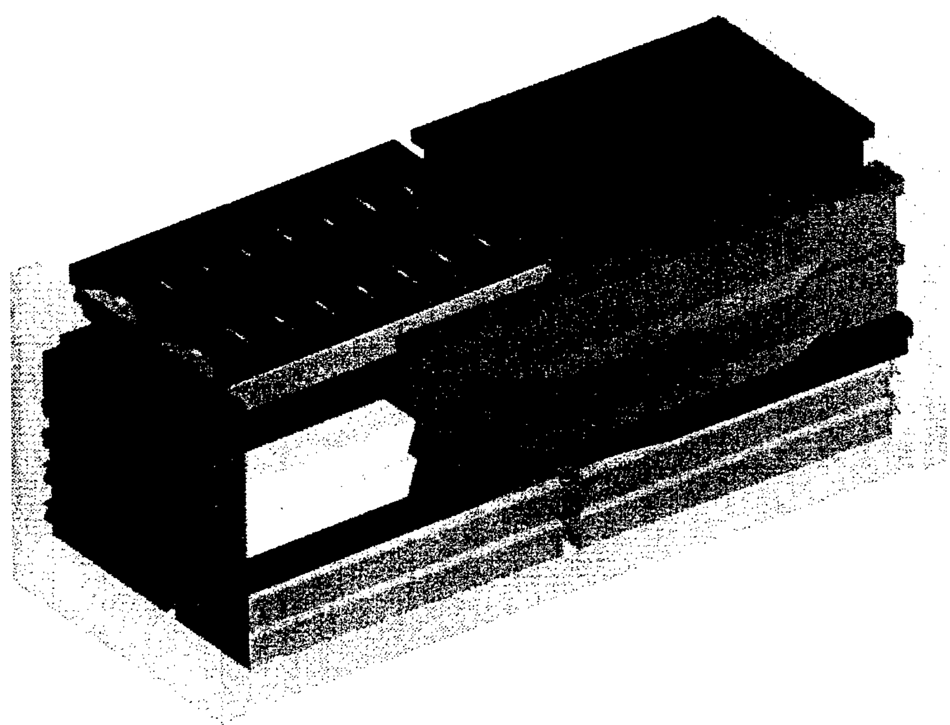


APPENDIX C (continued)
SCENARIO A FLATRACK LOADS

Deck & Ramp:

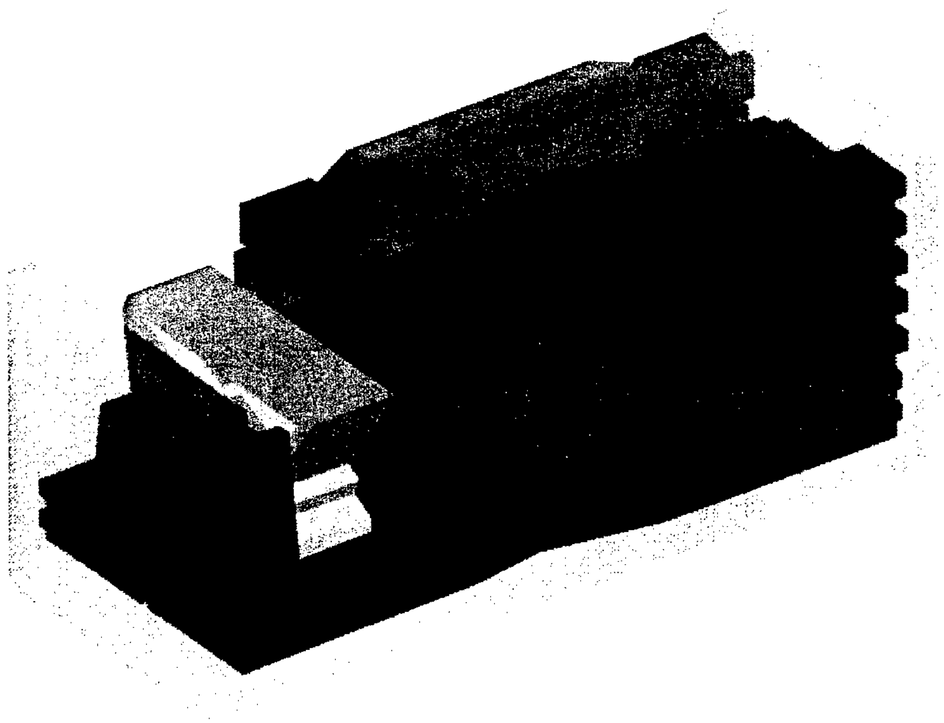


6-Bay SS Bridge:

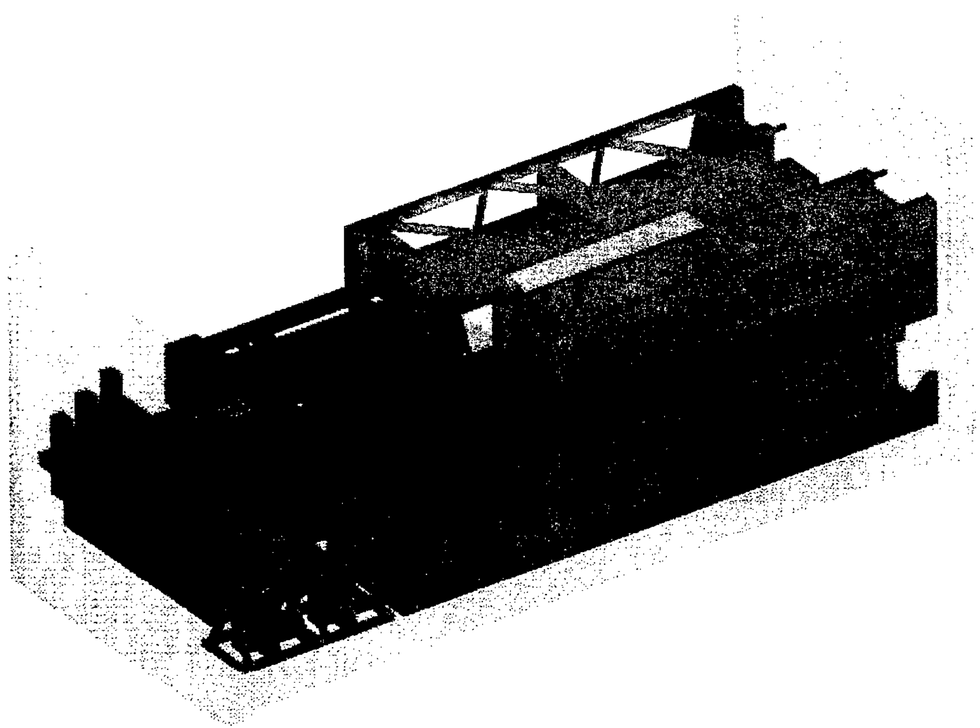


APPENDIX C (continued)
SCENARIO A FLATRACK LOADS

Spares:

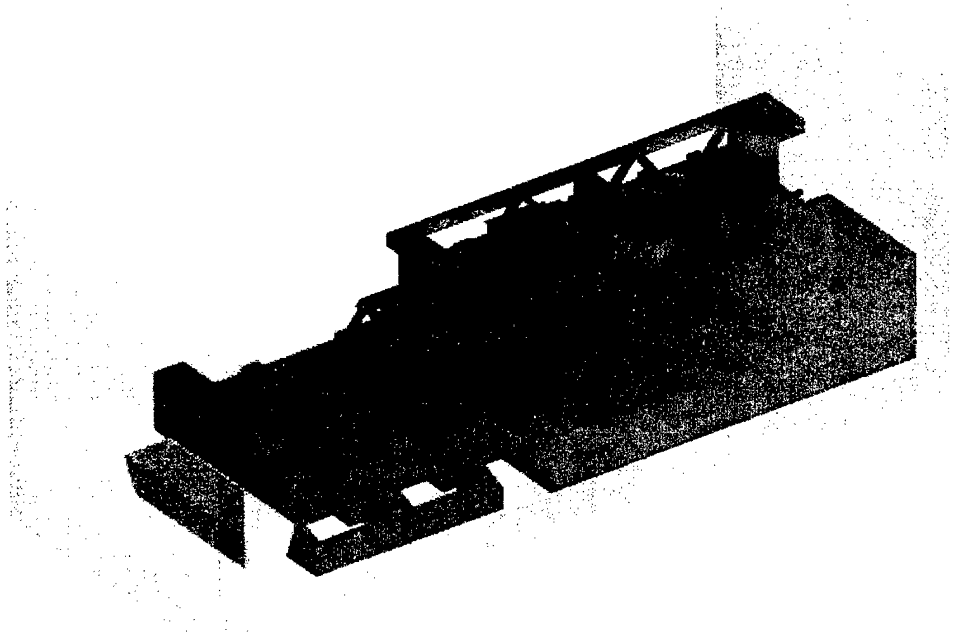


DS/SS Erection:

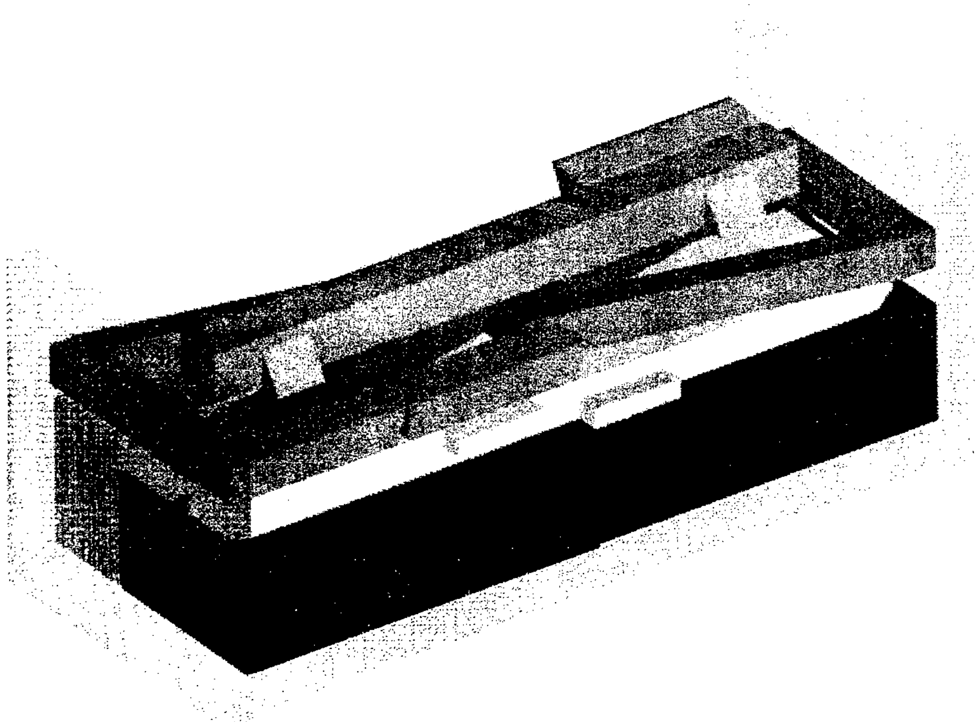


APPENDIX C (continued)
SCENARIO A FLATRACK LOADS

SS Erection:

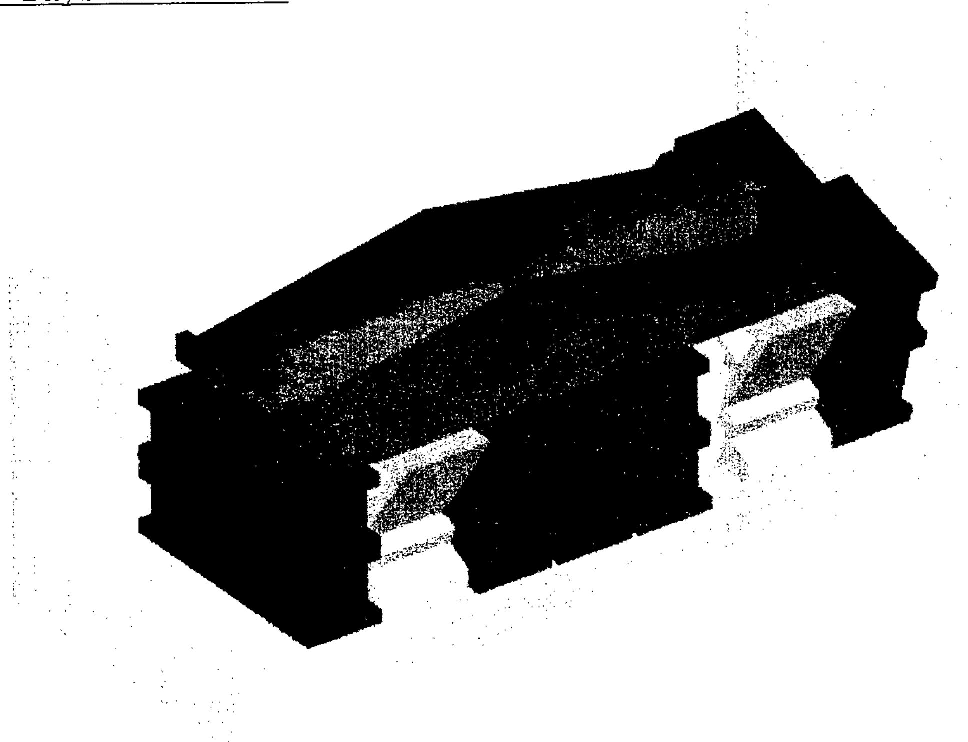


LRS:

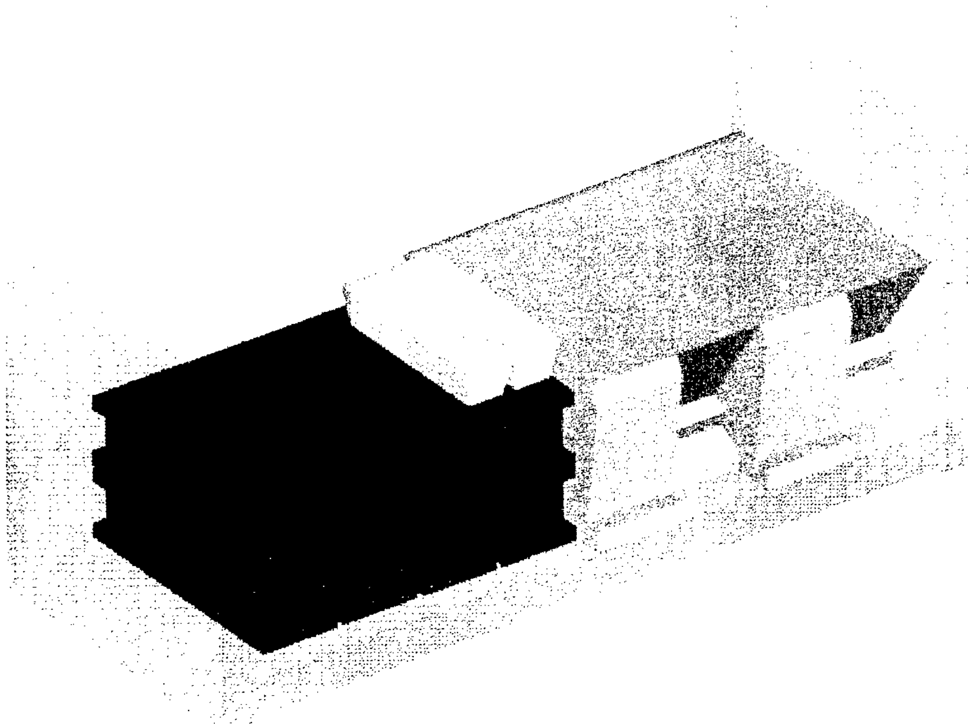


APPENDIX D
SCENARIO B FLATRACK LOADS

End + 2 Bays Flatrack:

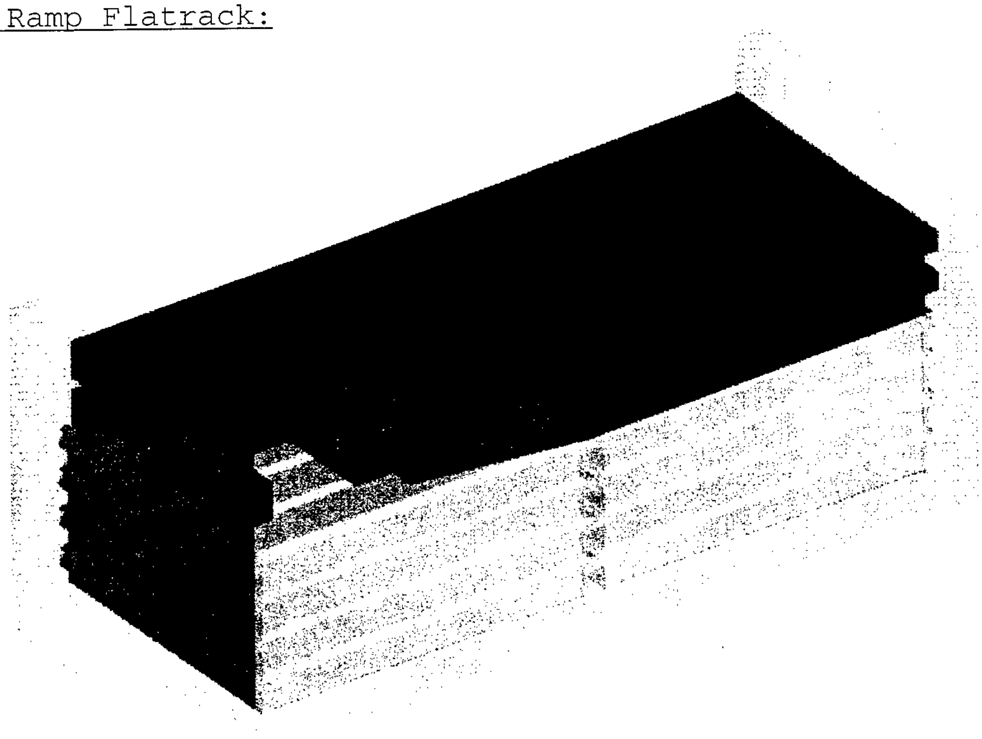


4 Bays Flatrack:

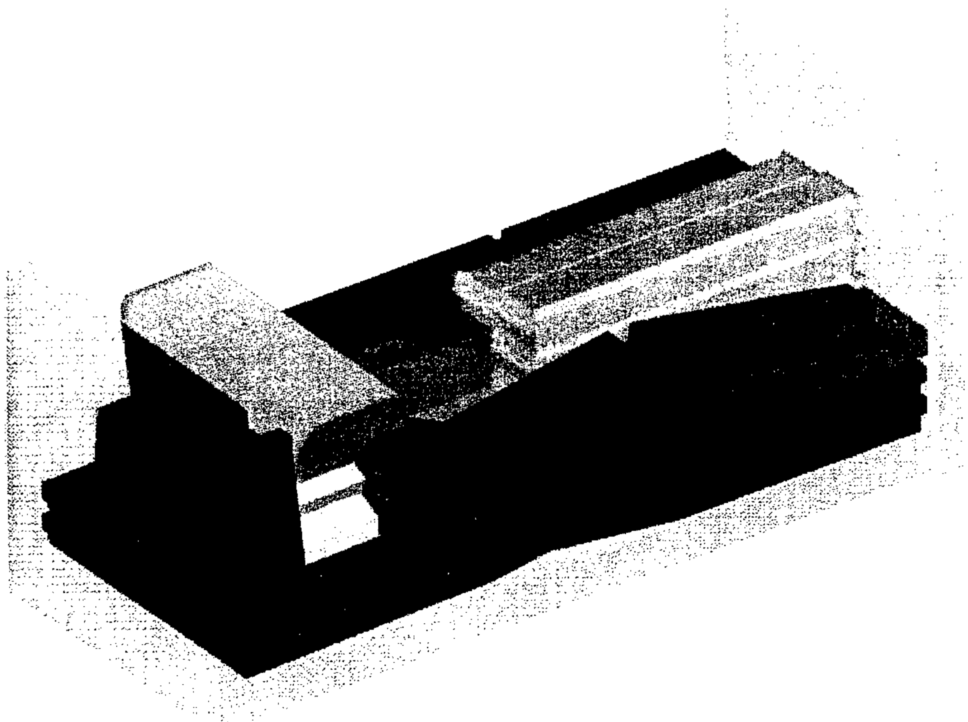


APPENDIX D (continued)
SCENARIO B FLATRACK LOADS

Deck & Ramp Flatrack:

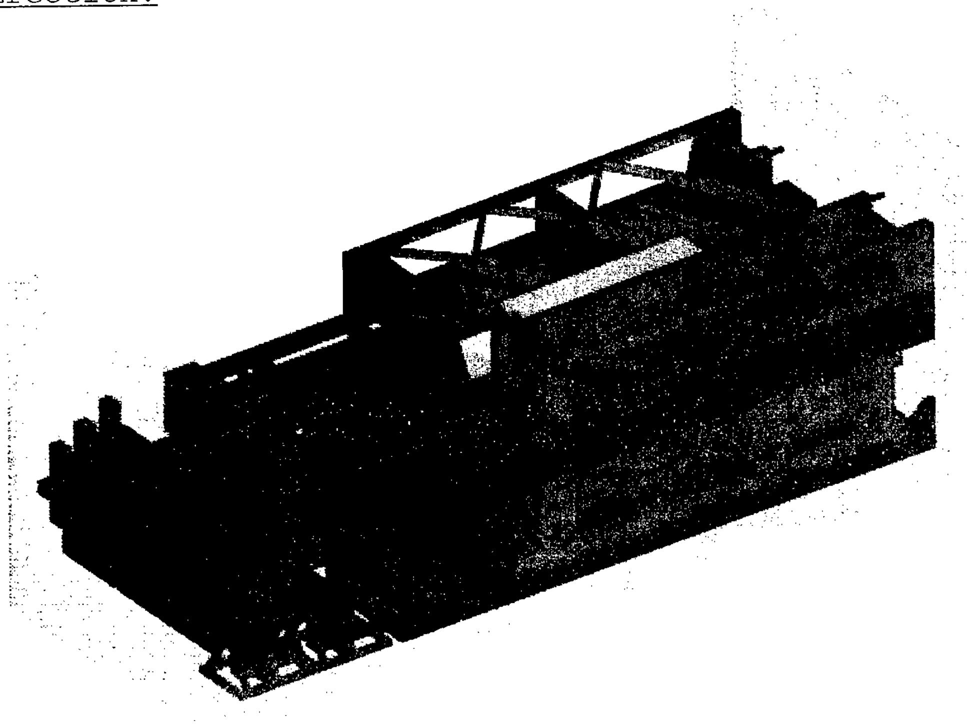


Spares Flatrack:

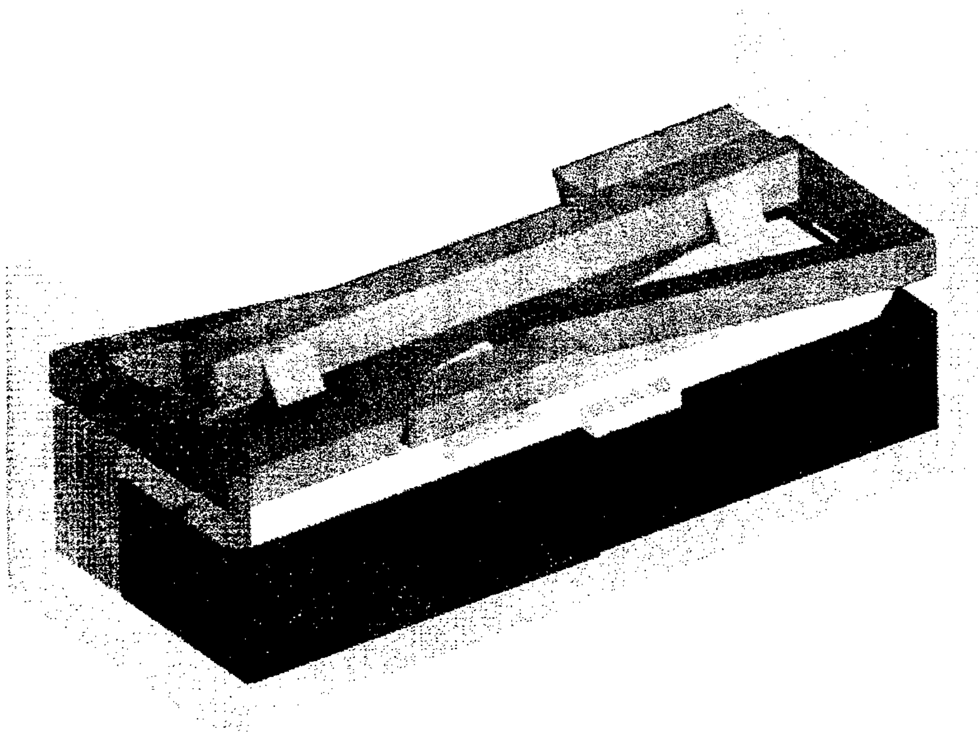


APPENDIX D (continued)
SCENARIO B FLATRACK LOADS

DS/SS Erection:



LRS:



DISTRIBUTION LIST

ORGANIZATION	COPIES
COMMANDER, US ARMY AVIATION - TROOP COMMAND WEAPON SYSTEMS MANAGER-ENGINEERING EQUIPMENT ATTN: AMSAT-D-WME 4001 GOODFELLOW DRIVE ST.LOUIS, MO 63120-1798	3
COMMANDANT, US ARMY ENGINEER SCHOOL DIRECTOR FOR TRAINING DEVELOPMENT ATTN: ATSE-T-TA-N FORT LEONARD WOOD, MO 65473	2
DEFENSE TECHNICAL INFORMATION CENTER ATTN: DTIC-BRR 8725 JOHN J. KINGMAN ROAD, STE 0944 FT. BELVOIR, VA 22060-6218	2
COMMANDER, US ARMY TANK-AUTOMOTIVE AND ARMAMENTS COMMAND DIRECTOR TARDEC ATTN: AMSTA-TR/204 WARREN, MI 48397-5000	1
COMMANDER, US ARMY TANK-AUTOMOTIVE AND ARMAMENTS COMMAND TECHNICAL DIRECTOR TARDEC ATTN: AMSTA-TR-R/202 WARREN, MI 48397-5000	1
COMMANDER, US ARMY TANK-AUTOMOTIVE AND ARMAMENTS COMMAND SUPPORT BRIDGE TEAM ATTN: AMSTA-TR-R/21 WARREN, MI 48397-5000	5
COMMANDER, US ARMY TANK-AUTOMOTIVE AND ARMAMENTS COMMAND BUSINESS MANAGEMENT TEAM ATTN: AMSTA-TR-O/204 WARREN, MI 48397-5000	1
COMMANDANT, US ARMY ENGINEER SCHOOL TRADOC SYSTEM MANAGER ATTN: ATSE-TSM FORT LEONARD WOOD, MO 65473	2

DISTRIBUTION LIST (continued)

ORGANIZATION	COPIES
COMMANDANT, US ARMY ENGINEER SCHOOL DIRECTOR FOR COMBAT DEVELOPMENTS ATTN: ATSE-CDM FORT LEONARD WOOD, MO 65473	2
COMMANDER, US ARMY MATERIEL COMMAND ATTN: AMCDE-SD 5001 EISENHOWER AVE ALEXANDRIA, VA 22333-0001	2
COMMANDER, US ARMY TRAINING AND DOCTRINE COMMAND ATTN: ATCD-MR FORT MONROE, VA 23651	2
DIRECTOR, MILITARY TRAFFIC MANAGEMENT COMMAND TRANSPORTATION ENGINEERING AGENCY ATTN: MTTE-DPE THIMBLE SHOALS BLVD, SUITE 130 NEWPORT NEWS, VA 23606	2
DEPARTMENT OF THE ARMY, OFFICE OF THE DEPUTY CHIEF OF STAFF FOR OPERATIONS AND PLANS ATTN: DAMO-FDD 400 ARMY PENTAGON WASHINGTON, DC 20310-0400	2
PROGRAM EXECUTIVE OFFICER, TACTICAL WHEELED VEHICLES ATTN: SFAE-TWV-HTV WARREN, MI 48397-5000	2
COMMANDANT, US MARINE CORP ASSISTANT PROGRAM MANAGER COMBAT ENGINEERING EQUIPMENT MARCORSYSCOM CSLE-CE 2033 BARNETT AVENUE SUITE 315 QUANTICO, VA 22134	2